

الفئة الرابعة



Faculty of Science
Chemistry Department

Final Examination for 4th (Industrial Program) Textile Chemistry
(404 Chem.)

Date: Friday, 16/06/2023

Time: 2 hours

Answer the following Questions:

(50 points)

- 1) Define the following terms: Textile , Apparel , Fabric.
- 2) Discuss the Essential properties of Textile Fibers ?
- 3) Explain the definition, composition and properties for the following fibers:
i) Cotton ii) Kapok iii) Jute iv) Hemp
- 4) What is the main difference between Wool and Cotton fibers? Draw its repeating unit?
- 5) Explain what you mean by (MAN MADE SYNTHETIC FIBRE), Giving two examples with its properties?
- 6) What is the significance of fiber evidence? How can use the fibers to reconstruct crime scenes?
- 7) Explain what are the main tests for the identification of Fibers? Then mention the basic comparison of fiber samples ?

Good Luck

Examiner:

Prof. Dr. Kamal Ibrahim Aly

Petrochemical Industries(409C)
Final Exam. for the 4th level Students (Industrial Chemistry)

Answer on the following Questions: (50 Marks)

Note: Support your answer with chemical equations whenever possible.

I]- Write on Only 5 of the following: (3 x 5 = 15 Marks)

- 1-Production of Synthesis Gas from Coal, Water gas and methanol.
- 2- Purification and separation of the components of of Synthesis gas.
- 3 -Application of Carbon Monoxide in Organic Synthesis.
- 4 -The present and future applications of Methanol.
- 5 -The different types of Synthetic Rubber and Synthetic Fibers.
- 6 - The principal industrial synthesis based on Acetylene.

II]- Complete Only 5 of the following equations : (3 x 5 = 15 Marks)

- | | | |
|---------------------------------------|---------------------------------|---|
| 1- $\text{CO} + \text{CH}_3\text{OH}$ | $\xrightarrow{\text{Catalyst}}$ | ? |
| 2- ClCN | $\xrightarrow{\text{Catalyst}}$ | ? |
| 3- $\text{CH}_4 + \text{Cl}_2$ | $\xrightarrow{\text{Catalyst}}$ | ? |
| 4- $\text{CCl}_4 + \text{HF}$ | $\xrightarrow{\text{Catalyst}}$ | ? |
| 5- Benzene + Ethylene | $\xrightarrow{\text{Catalys}}$ | ? |
| 6- $\text{CH}_4 + \text{NH}_3$ | $\xrightarrow{\text{Catalyst}}$ | ? |

ملحوظة هامة : الأسئلة صفحتان

III]- Mark Right (✓) or Wrong (X) on Only 10 of the following statements, and
Justify your answer : (2 x 10 = 20 Marks)

- 1- Natural gas and coal gasification products are feed stocks in petroleum industries. ()
- 2-Black coal contains higher amount of water and carbon. ()
- 3-The production of synthesis gas from natural gas and steam involves only Exothermic process. ()
- 4- Autothermal and Allothermal processes are involved in synthesis gas production from oil and steam. ()
- 5-Carbon monoxide can be applied with H_2 for production of methanol and hydrocarbons. ()
- 6- Yeast and Bacteria can synthesize protein from methanol and ethanol ()
- 7-Natural rubber is the polymer of cis 3-methyl-1,3-pentadiene monomer ()
- 8- Cyanuric chloride is a Dimer of cyanogen chloride. ()
- 9- Ag catalysts are not preferred for oxidative dehydrogenation of CH_3OH to $HCHO$ ()
- 10- Cyanogen chloride can be obtained via the reaction:
$$HCN + HCl \rightarrow ClCN + HBr$$
 ()
- 11-Surfactants are used in cleaning of clothes and have only a hydrophilic end. ()

Good Luck

Prof. Dr. Aboel Magd A. Abdel Wahab

Assiut University
Faculty of Science
Chemistry Department



Date: 11th January 2023
Time: 3 hours
Marks: 50

Wastewater Treatment Examination (C-410)

Answer the following questions: (50 Marks)

Question: 1- Discuss only two of the following: (10 Marks)

- 1) The effect of oil pollution on aquatic life and the methods used to control its impact.
- 2) Mercury (Hg) is one of the most toxic heavy metals; however, its toxicity depends on its chemical state.
- 3) Physical and chemical processing units used for treatment of industrial wastewater.

Question:2- Differentiate between only two of the following: (10 Marks)

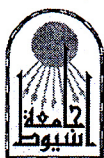
- 1) Biological oxygen demand (BOD) and chemical oxygen demand (COD) for the determination of the organic content in wastewater.
- 2) Aerobic and anaerobic treatment of wastewater.
- 3) Preliminary and primary treatment of domestic sewage wastewater.

Question:3- Put (✓) or (X) for the following sentences, and correct the wrong answer: (30 Marks)

- 1) Carbon adsorption is selective toward the removal of certain organic contaminants such as volatile organic compounds (VOCs).
- 2) Detergents that possess a linear chain are less biodegradable than those having branched carbon chain.
- 3) Water sample saturated with O₂ is incubated for 5 hours to determine the amount of sample BOD.
- 4) Turbidity test is a measure of the concentration of suspended solids in water sample.
- 5) Self-purification of water is directly proportional with the amount of DO.
- 6) The liquid form of water is lighter than its solid form; it expands by about 8% when it freezes and become less dense.
- 7) Lake at higher level will have a lower value of dissolved oxygen than one near the sea level.
- 8) The BOD value of industrial wastewater discharged from paper industry is usually higher than that of the food industry.
- 9) Plain sedimentation is more effective for the removal of total suspended matter than chemical precipitation.
- 10) Ultrafiltration has the ability to remove very fine particles even dissolved salts.

- 11) Refractory organic compounds are known to be easily removed by conventional treatment methods.
- 12) Hot water discharged into streams from industrial effluents increases the oxygen solubility.
- 13) Secondary treatment is merely a physical process designed to remove organic contaminants.
- 14) The objective of preliminary treatment processes is to remove heavy large inorganic solids in order to protect the operation.
- 15) Trickling biofilters uses anerobic microorganisms to metabolize the organic contaminants.
- 16) COD is more representative of amount of organic matter in wastewater than BOD.
- 17) API separators are more effective than CPI ones in oil removal.
- 18) Amount of dissolved oxygen is crucial for effective removal of organic matter through the activated sludge process.
- 19) Bio-Methylation process performed by microorganisms called methanogenic bacteria under aerobic conditions.
- 20) The most toxic form of mercury is the vapor form because it enters the brain through the blood stream causing damage to the central nervous system.
- 21) Phosphate based detergents are the main reason behind growth of algae (eutrophication).
- 22) Control of oil pollution in seas by skimming could be applied long after oil spills.
- 23) Organomercurials are non-toxic form of mercury unlike mercurous ions.
- 24) CPI separators can handle high flow and shock loads than API separators.
- 25) Anaerobic biological treatment produces methane as useful byproduct of the wastewater treatment process unlike aerobic treatment.
- 26) COD is a measure of oxygen that is needed by microorganisms to decompose the organic and inorganic pollutants in water.
- 27) Chemical oxidizing agent (KMnO_4) is used to degrade/oxidize organic matter during the COD test.
- 28) Alkalinity is determined by titrating water sample against mineral acids using methyl orange as an indicator.
- 29) Biomethylation process undergoes under anerobic conditions at pH range 8-9.
- 30) Both mercuric ions (Hg^{2+}) and mercury vapor (if inhaled) are toxic forms of mercury.

With my best wishes
Associate Prof. Haitham M. El-Bery



Industrial chemistry level 4 (Cement Specification)

May. 2023

time 2 hrs.



Assiut University

faculty of Science
Chemistry Department

Choose the right answer (A, B, C or D) of the following:-

1- According to Egyptian stander the max % of Mgo in cement is not more than:-

- A. 5%
- B. 4%
- C. 3%
- D. Less than 1%

2- According to Egyptian stander the accepted excess water in the mixer around:-

- A. 10%
- B. 12%
- C. 15%
- D. Another %

3- 5% of gypsum added to cement to:-

- A. Increase volume.
- B. Control quality
- C. Control sitting
- D. All of them

4- The priority of OPC cement to be: -

- A. Strong
- B. On quality target
- C. White color
- D. A and B

5- The priority of SRC cement to be: -

- A. Sulfate resistance
- B. Hard in fraction
- C. Lower cost
- D. Sitting within 2 hers

6- The best limestone can be used in White cement named: -

- A. Chock limestone
- B. Dolomite rock
- C. Normal limestone
- D. Any kind of them

7- The function of gypsum to give sitting after: -

- A. 2 minutes
- B. 20 mints
- C. 2 hors
- D. 2 days

8- The Egyptian stander fix the expiration time of cement as: -

- A. 20 days from the packing date
- B. 40 days from packing
- C. 60 days from packing
- D. 120 days from packing

9- The Egyptian stander fixes the deviation in weight as: -

- A. $\pm 1\%$
- B. $\pm 2\%$
- C. $\pm 3\%$
- D. $\pm 5\%$

10- To have a high fineness of cement you need

- A. Vertical cement mill
- B. High-efficiency separator
- C. Long dry kiln
- D. None of above

11- We consider the sulfate content in cement: -

- A. After adding gypsum
- B. After adding any kind of additive with gypsum
- C. No need to calculate sulfate.
- D. Another story

12- Low heat cement can be used in: -

- A. Normal foundation
- B. Underwater foundation
- C. Finishing of building
- D. Rainy condition.

13- In rainy counters the advice to use in a building: -

- A. OPC cement
- B. Slag Cement
- C. Oil well cement
- D. SRC cement

14- In a normal building the foundation must be done by: -

- A. OPC cement
- B. Slag cement
- C. Fly ash cement
- D. None of them

15- In slag cement, we fix the % of slag to be: -

- A. 5% slag
- B. 10 % slag
- C. 15% slag
- D. No limit if the quality is accepted.

16- The Slag material can supply by: -

- A. Industrial way
- B. Natural way
- C. Both A and B
- D. Another way

17- The higher fineness cement 52.5 % gave: -

- A. High quality
- B. High strength
- C. High cost
- D. All of them

18- We can use many types of additives in one brand of cement to: -

- A. Decrease cost of cement.
- B. Have a new brand of cement.
- C. Improve quality.
- D. All above

19- The Disadvantage of free lime in cement is: -

- A. Change color with time.
- B. Has fine crack in building after time.
- C. Decrease strength with time.
- D. Nothing happened.

20- The comparison between Slag cement and the Pozzolanic cement: -

- A. There is no big difference in function.
- B. There is a big difference between them.
- C. Given the same results.
- D. None of all

21- In the Egyptian stander we count the strength to be: -

- A. Increase with time.
- B. Decrease with time.
- C. Stable limit
- D. Not considering

22- We can use 10 % of gypsum in cement to have: -

- A. long time in the initial sitting
- B. White color of cement
- C. Reduce cost.
- D. Not happened.

23- In the foundation construction it is better to use: -

- A. OPC cement
- B. Oil well cement
- C. Low-heat cement
- D. SRC cement

24- Moderate cement is mixing between:-

- A. SRC cement with oil wall cement
- B. SRC cement 52.5 with SRC cement 42.5
- C. SRC cement with OPC cement
- D. SRE cement with Slag cement

25- Normal Portland cement (OPC) is used for:

- A. The basics of houses
- B. Concrete underwater.
- C. Normal building
- D. Petroleum job.

26- The function of Ready mix is: -

- A. Control mixing time
- B. Control quantity of different material
- C. Control contamination of water
- D. All above

27- Iron cement uses iron ore as an additive it can add as: -

- A. 5%
- B. 10%
- C. No limit if the quality is OK.
- D. Less than 5%

28- In all types of cement the most responsible about strength is: -

- A. C2S
- B. C3S
- C. C3A
- D. C4AF

29- Free silica can affect cement strength negatively because: -

- A. It is hard to grind.
- B. It can react later.
- C. It considers soluble material.
- D. It considers insoluble material.

30- The most expensive cement is.

- A. SRC cement
- B. Low-heat cement
- C. Petroleum cement
- D. All above

31- Oil wall cement contain active chemical additive to:-

- A. Be strong with time
- B. To react with the underground material
- C. To help the steel pipes not closed
- D. Not happen

32- The industrial additive which has cement behavior can add to cement with % like: -

- A. Air cold slag high ferric
- B. Air cold slag low ferric
- C. Water cold slag.
- D. All above

33- Free lime in Oil wall cement according to the Egyptian stander is :-

- A. less than 1.5 %
- B. less than 3%
- C. Almost zero
- D. Not considered

34- Water cold slag consider a better additive than Air cold slag because: -

- A. Alkali content is less after washing with water.
- B. Easy to grind after fast cooling.
- C. Improve the cement properties.
- D. A and B

35- The higher fineness of cement (52.5) is expensive because: -

- A. Reducing the total production
- B. Increasing the power consumption
- C. Both A and B
- D. Other reasons not mansion

36- In the Egyptian stander fix the upper limit of MgO in limestone to be less than:-

- A. 1%.
- B. 5 %
- C. 10 %
- D. No limit

37- Cement temperature outcome of any mill must be less than

- A. 135 degree
- B. 225 degree
- C. 50 degree
- D. No limit

38- The oil well clinker out target can be used as:-

- A. OPC cement
- B. Moderate cement
- C. SRC cement
- D. Finishing cement

39- The most important recommendation for aggregate to be:-

- A. Similar in quality
- B. similar in size
- C. similar in quality and size
- D. Similar in quality, size and clean from contamination.

40- The dry mix time for elements of concrete in the mixer:-

- A. One hour at least
- B. Half an hour
- C. Quarter An hour
- D. Five minutes is enough

41- The most important recommendation for mixing time after adding water:-

- A. Not less than one hour
- B. Not less than half an hour
- C. Not less than quarter hour
- D. No limit

42- The high cost of white cement comes from:-

- A. High cost of raw material
- B. High cost of thermal treatment
- C. A and B
- D. Less capacity of kiln production plus A and B

43- The most important properties of white cement is:-

- A. No change white color with time
- B. High strength with time
- C. Can replace gray cement in function
- D. High fines and fixed color

44- The A1 cement consider the best brand in finishing cement as :-

- A. Contain many strong additive
- B. Contain high clinker factor more than normal cement
- C. Contain oil well clinker
- D. Contain limestone material

45- The Insoluble % (Silica free) in cement must be less than

- A. 1%
- B. 2 %
- C. 2.5 %
- D. 3 %

46- In kiln of Oil well clinker we improve the clinker quality by:-

- A. Increase kiln speed
- B. Decrease kiln speed
- C. Decrease kiln speed and production level
- D. Using more catalases

47- Vertical cement mill is better than ball cement mill due to :-

- A. High volume of production
- B. Less power consumption
- C. Less cost
- D. All above

48- The Egyptian standard is flexible document because:-

- A. Updating every year
- B. Including new brands just matched with general quality
- C. Considering the needs of customers and market information
- D. All above

49- The Gassy phase of cement castable is indicate to

- A. Very good concreting job
- B.The finesse of cement is very high
- C.The excess of water is limited
- D. Using Ready mix pumping

50- The Karnack cement brand (Finishing cement) canceled due to:-

- A. Bad result in finishing job
- B.High cost
- C.Give many cracks after time
- D. A and c

Best regards

Essam Eldin Abd Ellatif



Assiut University
Faculty of Science
Chemistry Department



June: 2023
Time: 2 hours

Second Semester Examination for Biological Students
Subject: Analytical Chemistry (C- 460)

Answer Four only from the following questions: (50 Marks)

Q1) Answer the following: (12.5 Marks)

a) Write on the following:

- i. Electrochemical cell. ii. Fajan method iii. Half wave potential and factors affected on it.

b) Give the reason for the following:

- i. The equivalent weight for KMnO_4 in acidic medium is $1/5$ its molecular weight while in basic medium the equivalent weight is $1/3$ its molecular weight.
ii. Mohr method is applicable in neutral solution.

Q2) Answer the following: (12.5 Marks)

a) If you are provided with 0.1M NH_4OH (100ml) and titrated with 0.1M HCl.

calculate the pH value: ($k_b = 1.35 \times 10^{-5}$)

- i. at the beginning of the titration, ii. after the addition of 50 ml 0.1M HCl
iii. after the addition of 110 ml 0.1M HCl

b) Define the following:

- i. Ilkovec equation. Calculate the diffusion current (i_d) for the reduction of $5 \times 10^{-4} \text{M Zn}^{2+}$, which has diffusion coefficient (D) = $0.72 \times 10^{-5} \text{cm}^2 \text{sec.}$ $m = 15 \text{mg/sec.}$ and $t = 4 \text{sec/drop.}$
ii. Electrochemical series.

Q3) Answer the following: (12.5 Marks)

a) Write on the following:

- i. The applications and the determination of equivalent point in potentiometric titration.
ii. Limitation of volumetric precipitation titration reaction.

b) Show how you can use polarographic technique in qualitative and quantitative analysis.

Q4) Answer the following: (12.5 Marks)

a) During the titration of 100 ml of HCl (1N) using NaOH (1N), Calculate the pH

- i. before the titration. ii. after the addition of 50 ml NaOH (1N)
iii. after the addition of 100 ml NaOH (1N) iv. after the addition of 120 ml NaOH (1N).

b) Write on the following :

- i. Buffer solutions. ii. Nernst equation

Q5) Answer the following: (12.5 Marks)

a) Define the following :

- i. Acid-base indicators. ii. Oxidizing agent and reducing agent iii. Glass electrode

b) Explain Volhard method for the titration of chloride ions. This method must be used in acid solution. Why?

-----Good Luck-----

Examiner: Prof. Dr. Azza M.M.Ali



Final Examination of Selected Topics in Analytical Chemistry (C-444)
for 4th level Students

Choose the correct answer for the following: (50 Marks)

- The electrochemical analysis, in which the current is measured by keeping potential constant, is....
 A) Potentiometric titration B) Conductometric titration
 C) Amperometric titration D) Voltammetry
- In Daniel cell $Zn/ZnSO_4$ acts as
 A) Cathode B) Anode
 C) Both a and b D) Reference electrode
- The reference electrode that is thermally more stable is
 A) Calomel electrode B) Silver-silver chloride electrode
 C) Both are equally stable D) Both are unstable
- The ability of an indicator (measuring) electrode to respond to a single species of ion and not any other is referred to as:
 A) Sensitivity B) Accuracy
 C) Precision D) Selectivity
- Mercury covered by a layer of mercurous chloride in contact with saturated potassium chloride solution is a description of which of the following types of electrodes?
 A) Sodium B) Calcium
 C) Silver/silver chloride D) Calomel
- A very common interference for the glass pH electrode is
 A) CO_2 B) F^-
 C) Na^+ D) EDTA
- Indicator electrodes that respond directly to changing activity of electrode ions
 A) Electrodes of first kind B) Inert metal electrodes
 C) Reference electrodes D) Electrodes of second kind
- Electrodes made of pH sensitive glass may be used in the analysis of:
 A) pCO_2 B) pO_2
 C) pH D) (a) and (c) are correct
- In potentiometry, how many electrodes are used to make measurements?
 A) Three electrodes (indicator, auxiliary, reference)
 B) Two electrodes (indicator, reference)
 C) Four electrodes (indicator, auxiliary, counter, reference)
 D) You don't need electrodes to make the measurements.
- The EMF of the sample cell is determined by the following formulas:
 A) $E_{cell} = E_{ind.} + E_j - E_{ref.}$
 B) $E_{cell} = E_{ref.} - E_j - E_{ind.}$
 C) $E_{cell} = E_{ind.} - E_j - E_{ref.}$
 D) $E_{cell} = E_{ref.} + E_j - E_{ind.}$

11. A pH electrode is a good example of:
- A) A reference electrode
B) A metal indicator electrode
C) An ion selective electrode
D) An auxiliary electrode
12. The reaction that occurs in the electrolyte solution of the pCO_2 electrode resulting in a change in pH is
- A) $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3 \rightarrow \text{H}^+ + \text{HCO}_3^-$
B) $2\text{H}^+ + \text{CO}_3^{2-} \rightarrow \text{H}_2\text{CO}_3$
C) $\text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2$
D) $\text{CO}_2 + \text{H}_2\text{O} \rightarrow 2\text{H}^+ + \text{CO}_3^{2-}$
13. What is the $[\text{OH}^-]$ of a solution with a pH of 9.0?
- A) $1 \times 10^{-5} \text{ M}$
B) $1 \times 10^{-9} \text{ M}$
C) $1 \times 10^{-4} \text{ M}$
D) $1 \times 10^{-7} \text{ M}$
14. The electrode potentials are calculated using
- A) Ilkovic equation
B) Nernst equation
C) Ohm's law
D) Stokes equation
15. The suitable reference electrode for the electrochemical analysis at temperatures above 80°C .
- A) Calomel electrode
B) Silver/ Silver Chloride electrode
C) a and b
D) Mercury electrode
16. All of the following statements are correct regarding potentiometric titrations, except
- A) They are suitable for colored or turbid reactions
B) The emf of the cell is zero at the equivalence point
C) These are not suitable for analysis of dilute solutions less than 0.001M
D) Liquid junction potentials will not influence the study
17. Typical pH sensitive glass membrane electrodes are made up of
- A) Sodium silicate
B) Borosilicate
C) Lithium silicate
D) Both a and c
18. "The specific conductance (k) of a solution containing 1 gm equivalent of solute in 1000 cm^3 of solution." this sentence shows which term definition?
- A) Ohm's Law
B) specific conductance
C) Molar conductance
D) Equivalent conductance
19. Which is not an application of conductometry?
- A) Determination of moisture and water content
B) Purity of water
C) Conductometric titration & precipitation titration
D) Ionic product of water
20. In conductometry, if solution temperature increased by 1°C
- A) 1% rise in mobility of ions
B) 2% rise in mobility of ions
C) 3% rise in mobility of ions
D) 4% rise in mobility of ions
21. If the ion size is increased in solutions,
- A) Conductance decrease
B) Conductance increase
C) A and B
D) None of the above
22. In conductometric titration of HCl using NaOH, the increase in conductance after equivalence point is due to
- A) Increase in hydrogen ion concentration
B) Increase in hydroxide ion concentration
C) Decrease in hydrogen ion concentration
D) Increase in sodium ion concentration

23. In a mixture of acids always strong acid reacts first with the base. It is due to
- A) Weak acid will remain unionized B) Strong acid will remain unionized
C) Both A and B D) None of the above
24. Which indicator is used in conductometric titrations?
- A) Phenolphthalein B) Methyl red
C) Methyl orange D) None
25. Conductance of a medium does not depend on
- A) Number of free ions B) Charge of free ions
C) Mobility of ions D) Pressure of the ions
26. The reciprocal of electrical resistance is
- A) Specific conductance B) Current
C) Conductance D) None of the above
27. The resistance of a conductor varies inversely as
- A) Length B) Area of cross-section
C) Temperature D) Resistivity
28. Equivalent conductance of $\text{Fe}_2(\text{SO}_4)_3$ is related to its molar conductivity by the expression
- A) $\Lambda_{\text{eq}} = \Lambda_{\text{M}}$ B) $\Lambda_{\text{eq}} = \Lambda_{\text{M}} / 3$
C) $\Lambda_{\text{eq}} = 3 \Lambda_{\text{M}}$ D) $\Lambda_{\text{eq}} = \Lambda_{\text{M}} / 6$
29. The cell constant is defined as the ratio of
- A) Area of either electrodes to the length between the electrodes
B) Length between the electrodes to the area of either electrodes
C) Length between the electrodes to the volume of either electrode
D) Resistivity to conductivity
30. The equivalent conductance of 0.1N H_2SO_4 offering a resistance of 50 ohms when placed in a conductivity cell whose electrodes are 1cm apart with a cross-sectional area of 2cm^2 at 25°C is?
- A) $100 \text{ S cm}^2 \text{ eq}^{-1}$ B) $1000 \text{ S cm}^2 \text{ eq}^{-1}$
C) $10 \text{ S cm}^2 \text{ eq}^{-1}$ D) $1 \text{ S cm}^2 \text{ eq}^{-1}$
31. Displacement titrations mean that
- A) Salt of a weak acid is titrated with a strong base
B) Salt of a weak acid is titrated with a strong acid
C) Salt of a weak base is titrated with a strong acid
D) None of the above
32. The selectivity and sensitivity of fluorescence spectroscopy is higher than that of absorption spectroscopy because of all of the following EXCEPT
- A) Fluorescence substance have different λ_{max} of excitation and emission
B) Rigid molecules can only fluoresce
C) Fluorescence intensity depends on the intensity of the incident radiation
D) Every molecule that absorbs in UV region can show fluorescence
33. Phosphorescence mainly results from
- A) Internal conversion B) Vibrational relaxation
C) Intersystem crossing D) All of the above

34. An organic compound has shown emission patterns as below when it is excited at 254 nm. Img
Select the type of fluorescence observed
- | | |
|--------------------------|------------------------------|
| A) Stoke's fluorescence | B) Anti-stoke's fluorescence |
| C) Resonant fluorescence | D) No fluorescence |
35. In fluorescence spectroscopy, emission spectra is obtained by keeping
- A) Excitation wavelength constant
B) Emission wavelength constant
C) Both excitation and emission wavelength constant
D) Both excitation and emission wavelength varying
36. Fluorescence is much faster than phosphorescence because
- A) The states of multiplicity vary with energy of excitation
B) Transition between the states of different multiplicity is a faster process.
C) Transition between the states of different multiplicity is a slower process
D) Transition between the states of different multiplicity is as fast as that between states of similar multiplicity
37. Quantum yield of fluorescence is the ratio of intensities of
- A) Incident radiation to fluorescent radiation
B) Fluorescent radiation to incident radiation
C) Absorbed radiation to fluorescent radiation
D) Fluorescent radiation to absorbed radiation
38. Fluorescence is a result of transition of electron from
- A) Singlet ground state to singlet excited state
B) Lower singlet excited state to singlet ground state
C) Triplet excited state to singlet ground state
D) Triplet ground state to singlet excited state
39. When the average life time of the excited electron is in the order of 10^{-12} sec it mainly results in
- | | |
|---------------------------|---------------------|
| A) Fluorescence | B) Phosphorescence |
| C) Vibrational relaxation | D) All of the above |
40. Resonance fluorescence is a relaxation of an excited state by
- A) Emission of a photon of higher frequency than the excitation frequency
B) Emission of a photon of the same frequency as the excitation frequency
C) Emission of a photon of lower frequency than the excitation frequency
D) Without emission of a photon
41. Fluorescence quenching is caused by
- | | |
|-------------------------|------------------------|
| A) Internal conversion | B) External conversion |
| C) Intersystem crossing | D) None of the above |
42. Energy transfer takes place to vibration mode in ?
- | | |
|------------------------|-------------------------|
| A) Internal Conversion | B) Intersystem Crossing |
| C) External Conversion | D) All Mentioned Above |
43. Fluorescence intensity decreases with ?
- | | |
|-------------------------------|----------------------------|
| A) Increase in Temperature | B) Decrease in Temperature |
| C) Independent of Temperature | D) Always Constant |

44. Phosphorescence occurs at
- A) The same wavelength as fluorescence
B) Lower wavelength than fluorescence
C) Higher wavelength than fluorescence
D) None of the above
45. Spectrofluorimetric method for the determination of paracetamol is based on its oxidation by
- A) Potassium permanganate
B) Ceric sulphate
C) Sodium hypochlorite
D) Iodine
46. Metal-calcein complexation reaction resulting in
- A) High efficient quenching of fluorescence
B) Enhancement of fluorescence
C) No effect on fluorescence
D) None of the above
47. The electroanalytical technique that involves the measurement of electricity consumed in a redox reaction of the analyte is
- A) Potentiometry
B) Conductometry
C) Coulometry
D) Polarography
48. Sulfide in a water sample is titrated with electrolytically generated Fe^{2+} . If a 10 mL aliquot of the water sample requires a current of 0.75 A for 5.4 minutes to reach the end point, what is the molarity of sulfide in the water sample?
- A) 0.0013 M
B) 1.26 M
C) 0.05 M
D) 0.126 M
49. Coulometric technique can be used for determination of
- A) Volatile reactants
B) Unstable reactants
C) Radioactive materials
D) All of the above
50. The quantitative analysis of a non-Fluorescent compound is done by
- A) Fluorescent quenching
B) Formation of fluorescent reactive product
C) Fluorescence labeling
D) All of the above

Good Luck,,,

Examiners: Dr. Mohamed Kotb

Dr. Doaa Abdel-rahman

Examination of Surface Chemistry & Electrochemistry for 4th Level Student (Chem.432)



Assiut University

Chemistry Major

Time :3 h

Date: 31 / 5 / 2023



Faculty of Science
Chemistry Department

Section I (33 Marks)

Answer the Following Questions:

A)- Choose the correct answer

(5 Marks)

- Selective catalyst should
(i) Increase the reaction rate (ii) Change the reaction products
(iii) Increase the number of molecules adsorbed on the catalyst surface
(iv) Proceed the reaction to desired product
- What is true for catalytic reaction
(i) Catalyst increases equally both the rate of forward and reverse reactions
(ii) Catalyst does not effect to equilibrium constant
(iii) Catalyst decreases activation energy (iv) Catalyst increases activation energy
- According the chemical approach the desirable energy for decomposition the intermediate complex is:
(i) High energy (ii) Low energy (iii) Intermediate energy (iv) None of these
- The disadvantage of a homogeneous catalyst is.
(i) Corrosion problems (ii) Poisonous (iii) Expensive (iv) All of them
- Doping of silicon with boron leads to
(i) n- type semiconductor (ii) p- type semiconductor (iii) Metal (iv) Insulator
- What type of crystal defect is indicated in the diagram below
Na⁺Cl⁻Na⁺Cl⁻Na⁺Cl⁻
Cl⁻Cl⁻Na⁺Na⁺
Na⁺Cl⁻Cl⁻Na⁺Cl⁻
Cl⁻Na⁺Cl⁻Na⁺Na⁺
(i) Frenkel defect (ii) Frenkel and Schottky defects (iii) Interstitial defect
(iv) Schottky defect
- The materials which are weakly repelled by the magnetic field are known as
(i) Diamagnetic materials (ii) Paramagnetic materials (iii) Ferromagnetic materials
(iv) Ferrimagnetic materials
- Extent of physisorption of a gas increases with
(a) Increase in temperature (b) Decrease in temperature (c) Decrease in surface area
(d) Decrease in strength of Vander Waals forces
- How magnitude of adsorption gas is expressed?
(i) $\frac{m}{x}$ (ii) $m \cdot \Delta x$ (iii) $\frac{x}{m}$ (iv) $x + m$

10. Due to adsorption

- (a) surface energy increases (b) surface energy becomes zero (c) surface energy decreases (d) no change occurs in surface energy

B) - Put (✓) or (×) for following sentences

(5 Marks)

- 1- The repeated slip motion many times in the crystals responsible for the plasticity of crystals ()
- 2- The freedom of the valence electrons to move through a metal give rise to low electrical conductivity ()
- 3- If the reflections of all lattice positions through a point brings a coincidence of point there is a center of symmetry ()
- 4- The position in energy of the absorption peaks associated with defect centers provides a direct measure of the ionization energy of an electron attracted to the center ()
- 5- Paramagnetic results from the presence of a permanent dipole moment ()
- 6- The doping of ZnO with Al^{3+} increases of its electrical conductivity ()
- 7- Physical adsorption is relatively specific ()
- 8- The turnover number is the number of molecules that react per site per unit time ()
- 9- The maximum rate of reaction is obtained when the bond between the adsorbed complex and the catalyst surface is too weak ()
- 10- The basic concept of a catalyst is that of a substance that in large amount causes a large change ()

C)- Define the following terms:

(3 Marks)

- a) Adsorption isotherm b) Catalyst stability c) Structure Promoters d) Chemisorption
e) Frenkel defects f) Nonstoichiometry of solids

D)- Short answer

(10 Marks)

1. Effect of Li^+ ions doping on the electrical conductivity of NiO and ZnO.
2. What are the effects of temperature and pressure on physical and chemical adsorption.
3. What is the meaning of catalyst (A) is more active and selective than that of catalyst (B).
4. Point defects.
5. Important physical properties of industrial catalyst.

E)- Answer two only questions from the following:

(10 Marks)

1. Derive an empirical law that be used for calculation the average area occupied by each molecule adsorbed on the surface in oil/water system.
2. Apply the V_a-t method for calculating of S_t and porosity of solid catalyst.
3. Explain the precipitation method used for synthesis of solid catalysts taking in your consideration all the precipitation conditions.

Section II

Electrochemistry (17 Marks)

Q1 Complete the following sentences

(5 Marks)

- i) Cell type: a cell with $\Delta G < 0$ is, while that with $\Delta G > 0$ is
- ii) The electrons can be derived from the cations or anions at the cathode like and, respectively.
- iii) Homo-Lumo gap in solution conductor is correspond to in electronic conductor.
- iv) If the chemical potential is μ , the electrochemical potential is
- v) The magnitude and sign of zeta potential depends on and
- vi) is the process in which an ion is surrounded by water molecules.
- vii) If C is the concentration of $AlCl_3$ solution, the salt activity formula (a_{salt}) is
- viii) One of limitations of the Debye-Huckel law is
- ix) Some organic polymer compound like Nafion is consider as
- x) The Galvani potential difference is consist of and

Q2 Answer only three from the following

(4 Marks for each one)

- 1) Describe the energy profile of lithium ion reduction electrode reaction before and after applying of positive $\Delta\Phi$ potential, drive the electrochemical rate equation for this electrode reaction.
- 2) Using Debye – Huckel Limiting Law drive an equation indicates the “kinetic salt effect” phenomenon.
- 3) Define and indicate the functions of the salt bridge, essential requirements of its materials.
- 4) Define the corrosion and indicate the basic causes of corrosion.

Good Luck

Prof. Dr. Abd El-Aziz A. Said, Prof. Dr. Abo El-Hagag Abd El-Aziz

**Final Examination in Selected Topics in Organic Chemistry (C-414)****Answer the following Two sections: (50 Marks)****Section (A): Chemotherapy (17 Marks)****Question 1: Answer the following questions:** (4 Marks)

- What is histamine?
- Show how the exposure to allergens induces the release of histamine in the body.
- Metabolism of histamine.

Question 2: Write on metabolite antagonists. (3 Marks)**Question 3:** Show by equations the synthesis of penicillin Or omeprazole. (3 Marks)**Question 4:** How can you estimate the sulfa drugs in the biological fluids? (3 Marks)**Question 5:** How can you proof the structure of the fragment of B ($C_6H_9O_3N_3S$) of vitamin B₁? (4 Marks)**Section (B): Protein Synthesis and Hormones (33 Marks)****Question 1: Define the bond for which of the following roles:** (4 Marks)

- Joins complementary nucleotides in two strands.
- Joins adjacent nucleotides in one strand.
- Links base to pentose in nucleotide.
- Difference between a nucleoside and a nucleotide

Question 2: Answer the following questions (15 Marks)**A. Hormones control many different bodily processes.**

- Define the hormones, their actions or functions and their names.
- Explain the types of hormones giving an example for each type.

B. There are specialized glands in human body are known as endocrine glands.

- Define the endocrine glands.
- Explain the types of the endocrine glands and the function for each type.

Question 3: Put (✓) for the correct statement and (×) for the wrong one: (4 Marks)

1. The HIV-1 virus is a retrovirus that infects T4 lymphocyte cells.
2. During the protein synthesis, each mRNA bonds to a specific amino acid at the acceptor stem.
3. The transfer RNA makes up 2/3 of ribosomes where protein synthesis takes place.
4. The sugar-phosphate backbone of a nucleic acid is directional.

Question 4: Draw the structures of the following species: (10 Marks)

- | | |
|-------------------------------------|------------------------------------|
| 1. Deoxyadenosine 5'-monophosphate. | 2. (S)-thyroxine (T ₄) |
| 3. Cytidine 5'-monophosphate. | 4. Azidothymine. |
| 5. Adrenaline | 6. Liothyronine. |
| 7. Tyrosine | 8. Cortisol |
| 9. Melatonin. | 10. Tryptophan. |

Good Luck

Examiners: Prof. Dr. Hussein El-Kashef & Dr. Ahmed Abdou.



Faculty of Science
Chemistry Department

Final Examination for B.Sc. (Chemistry major)
Applied Organic Chemistry (412 C): (Polymers and Textiles)

Date: Friday, 16/06/2023

Time: 2 hours

Answer Eight Only from the following:

(50 points)

- 1) Is it possible to make polyethylene from cyclohexane? If not, say why? then show examples of ring opening polymerization?
- 2) Mention the : Advantages, Disadvantages, Uses and Care for:
i) Cotton ii) Wool iv) Acrylic
- 3) Discuss with examples the types of Initiators, and what you mean by HIPS ?
- 4) Compare between the step- and chain- growth polymerization, and also compare, giving reason, between the time needed in polymerization of theses monomers: (Vinyl Chloride, Styrene, MMA).
- 5) In the living polymerization, show by equations how can we put an ending for the living chain (Carbanion).
- 6) " Carbon Fibers..... the wonder polymer..... stronger than the steel". Show by equations the steps of production of this polymer.
- 7) Show the mechanism of ring opening the caprolactam moiety to form Nylon 6 and draw the structure for the Monomer and Polymer for : PVC , PMMA, and PP.
- 8) Explain what are the main tests for the identification of Fibers?
- 9) Explain by (equations or structures): Backbiting- Dianions, Self-initiator.

Good Luck

Examiner:

Prof. Dr. Kamal Ibrahim Aly

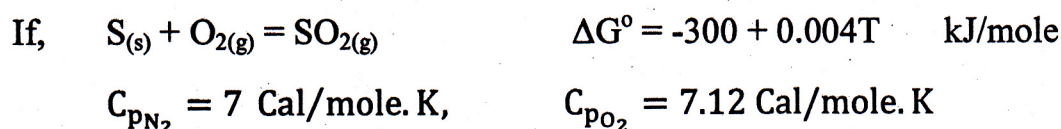
Assiut university Faculty of science Chemistry department	Final exam Time: 2 hours Unit process in fertilizer industry	Industrial chemistry Fourth level (400 Eng)
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First question

(20 degrees)

A burning furnace in fertilizer factory consumes 20 ton per day sulfur. Temperature of exhausted gases is 1000°C.

- Calculate the excess air ratio.
- Calculate the final composition of exhausted gases.

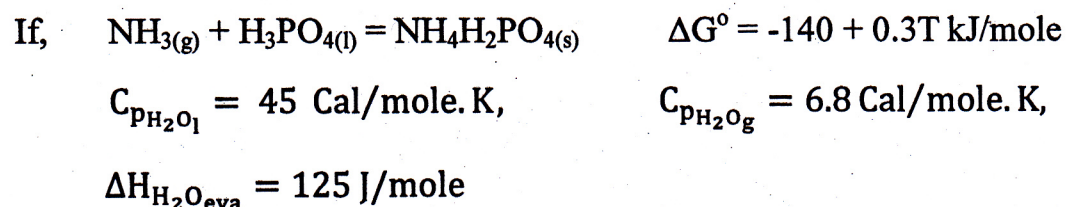


Second question

(15 degrees)

For producing MAP fertilizer needs to react ammonia with phosphoric acid (60 %) at 100°C.

- Calculate the amount of water content in the final product.

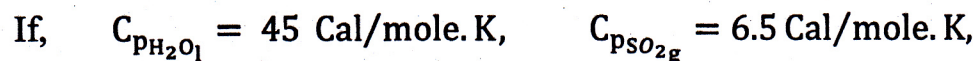


Third question

(15 degrees)

A heat exchanger used for cooling sulfur dioxide with rate 120 m³/hour from 1000 to 600°C. The water charges at room temperature and outlet at 99°C.

- Calculate the amount of water.



Good Luck

Question 1: (15 Marks)

Mark True (T) for right statement and False (F) for wrong statement:

- 1- Microelectrodes reach the state of polarization very slowly.
- 2- Migration is the movement of ions from a region of lower concentration to a region of higher concentration.
- 3- In anodic stripping methods, the working electrode behaves as a cathode during the deposition step.
- 4- One important application of amperometry is in the construction of electrochemical biosensors.
- 5- A non-polarizable electrode is one that has variable potential.
- 6- In polarography KCl is added to analyte solution to eliminate migration current.
- 7- The half wave potential ($E_{1/2}$) can be used to identify the analyte concentration.
- 8- According to the Randles-Sevcik equation, decreasing the scan rate will result in an increase in the measured current.
- 9- A cyclic voltammogram of a reversible process is characterized by $\Delta E_p > 59/n$ (mV).
- 10- Heyrovsky-Ilkovic equation determines the number of electrons from the slope.
- 11- In normal pulse voltammetry, the output of the current response is a symmetric Peak.
- 12- Various functional groups, such as C=O, N=N, and NO₂ are oxidized in the polarographic range.
- 13- Normal pulse is about 5-10 times more sensitive than differential pulse polarography.
- 14- Surface area of polarizable electrode is very small.
- 15- The dissolved oxygen present in experimental solution in acidic medium gets easily reduced at DME to form H₂O₂, in the first step.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						.								

Question 2: (5 Marks)

Write the mathematical equation for Two from the following:

(A) Heyrovsky-Ikovic equation:

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(B) Randles-Sevcik equation:

This image shows a single sheet of white paper with ten horizontal dashed lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There is no text or other markings on the paper.

(C) Ilkovic equation:

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Question 3: (5 Marks)

- (A) The limiting diffusion current that would be expected from the reduction of 2×10^{-4} M Zn^{2+} is $1.81 \mu\text{A}$. Using the DME characteristics, $m = 2.0 \text{ mg/s}$ and $t = 4\text{s}$. Calculate the diffusion coefficient of Zn^{2+} .

- (B) The reversible oxidation of dobutamine (DOB) is a $2e^-$ process. A cyclic voltammetric anodic peak current of $2.2 \mu\text{A}$ is observed for 0.4 mM solution of DOB in phosphate buffer at a glassy carbon electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will the peak current be for scan rate of 100 mV/s and 1.2 mM DOB?

Section (B): Answer the Following Questions: (25 Marks)

Part I: Enter in the appropriate box the expressions you would select to define each of the phenomena Labeled [1]-[15] inclusive. (15 points)

Expression	Phenomena
Cold vapor technique	[1] In that the absorbance (A) is directly proportional to the concentration of the absorbing species (c) and the path length (b) of the absorbing medium.
Hydride generation method	[2] Is simply defined as "the fraction of light that reaches a detector in UV/visible spectrophotometer after passing through a sample.
Standard addition method	[3] The most common source for atomic absorption measurements. It emits the specific resonance lines of the atoms in question.
Wavelength selector	[4] A device used for converting solution into fine spray or droplets in AAS.
Bathochromic shift	[5] An atomization method used only to the determination of mercury.
Wavenumber ($\bar{\nu}$)	[6] A characteristic value for each substance at a particular wavelength.
Hypsochromic shift	[7] A device that measures the difference between the transmitted light through the sample (I) vs. the incident light (I_0) and sends this information to the recorder.
Zeeman effect	[8] A method is used for the determination of analytes in a complex matrix where interferences for the analyte will occur: i.e. blood, sediment, human serum, etc.
Chromophore	[9] An atomization method used for the determination of highly toxic elements such as arsenic (As), antimony (Sb) and lead (Pb).
Photoelectric transducer	[10] It is used for background correction in AAS by place flame polarized light through sample in magnetic field get absorbance (atom+molecule) or absorbance (molecule) depending on how light is polarized.
Nebulizer	[11] A device that isolates a restricted region of the electromagnetic (EM) spectrum used for measurement in the UV-Vis spectrophotometer.
Beer's law	[12] A shift to higher wavelength (λ) or lower energy.
Molar absorptivity	[13] The number of waves per cm in units of cm^{-1} and equal to $1/\lambda$.
Transmittance	[14] A group of atoms in a compound responsible for the absorption of electromagnetic radiation.
Hollow cathode lamp	[15] A shift to shorter wavelength (λ) or higher energy.

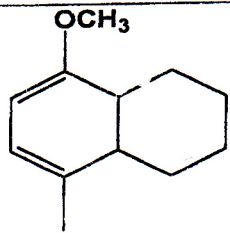
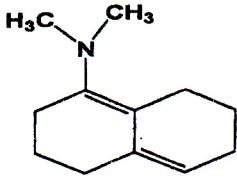
[1]	
[2]	
[3]	
[4]	
[5]	
[6]	
[7]	
[8]	

[9]	
[10]	
[11]	
[12]	
[13]	
[14]	
[15]	

Part II: Problems and Questions

(10 points)

- Using Woodward-Fieser rule, calculate the wavelength of absorption maximum (λ_{max}) of the following compounds: **(2 points)**

Compound (I)	Compound (II)
 $\lambda_{\text{max}} =$	 $\lambda_{\text{max}} =$

- Describe the disadvantages of the Graphite Furnace Technique. **(2 points)**

3. The drug tolbutamine (270 g/mol) has a molar absorptivity of $703 \text{ L mol}^{-1} \text{ cm}^{-1}$ at 262 nm. Five tablets are dissolved in water and diluted to a volume of 2 L. If the solution exhibits an absorbance in the UV region at 262 nm equal to 0.687 in a 1.0 cm cell. (2 points)
- a. Calculate the concentration of the tolbutamine drug.
- b. How many grams tolbutamine are contained per tablet (g/tablet)?
4. A spectrophotometric method used to determine Pb^{2+} in blood gave an absorption of 0.193 when 1.00 ml of the samples was diluted up to 5 ml. To a second 1.00 ml blood sample was added exactly 0.001 ml of the standard solution of 1560 ppb Pb^{2+} and then diluted up to 5 ml. The second sample gave an absorption of 0.419. What is the concentration of Pb^{2+} in the blood sample? (2 points)
5. With respect to chemical interferences in AAS, explain the formation of compound of low volatility and the methods used for its elimination. (2 points)



Analytical and Bioanalytical Chemistry (C-441) Exam

Answer the following Questions: (50 marks)

1. In selecting sampling points for water analysis, what are the general criteria that should be usually considered? (5 marks)
2. State the three types of chlorine residual that must be measured in water sample? (5 marks)
3. What is the common method for detection of specific fragments of DNA? Discuss in details. (5 marks)
4. Discuss- in details- the basic principles of electrophoresis. (5 marks)
5. **Complete:** (30 marks)
 - a. -----, ----, and ----- should be tested immediately after water sampling as they will change during storage and transport.
 - b. The range of health-related parameters in water may include: ----- (known to occur naturally), ----- (intensification of farming leading to elevated levels in groundwater), ----- (used in plumbing), ----- (areas where it is mined), ----- (occur naturally) and ----- (local practices).
 - c. Liquid chromatography is a separation technique based on ----- between ----- and -----.
 - d. To increase separation efficiency, high velocities and small-diameter ($10\ \mu\text{m}$) particles are essential as the stationary phase, this leads to -----, to overcome this back-pressure, ----- is necessary for transport of the mobile phase (high-pressure- or high- performance liquid chromatography, HPLC).
 - e. GC can be used for samples that can be ----- without decomposition at temperatures up to ca. -----°C.
 - f. Fluorescence Detectors provide high ----- and -----, which is the reason for its use in ----- analysis. The high selectivity results from the fact that only a few analytes are able to -----.
 - g. Electrophoresis is based on the ----- particles in an electric field.

- h. There are three electrophoretic matrices in use -----, -----, and -----.
- i. The 2-acrylamidoglycolic acid (pK 3.1) species is useful for separating -----
 ---- proteins, since it extends the pH gradient to as low as pH 2.5, whereas N,N-Diethylaminopropylacrylamide (pK 10.3) has been used for analysis of -----
 ----- proteins.
- j. In CZE, by forming a chiral complex with a component of the background electrolyte it is possible to resolve ----- of amino acids.
- k. In the DNA analysis the Cot curves represent the ----- of DNA in moles of nucleotide per liter versus the -----.
- l. Cot curves are based on the observation that DNA can be ----- by heat and will -
 -----when the temperature is dropped.
- m. The most important enzyme types used in molecular biology are: -----, -----
 -----, -----, ----- and -----.
- n. DNA can be detected by either -----, -----, -----
 ---- or -----method of analysis.
- o. Electrochemiluminescence is a very specialized technique for DNA analysis in which an -----
 ----- reaction produces -----, after which decay to -----
 -----.

Good Luck

Prof. Nagwa Abo El-Maali